

IDENTIFICATION OF *OSMIA KENOYERI* AND *O. VIRGA* (HYMENOPTERA: MEGACHILIDAE), TWO BLUEBERRY POLLINATORS^{1, 2}

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ABSTRACT: The sexes of *Osmia kenoyeri* and *O. virga* are associated and the females of both are described. Both species visit lowbush blueberry, *Vaccinium* spp. for pollen and nectar. The nesting biology of *O. kenoyeri* is described.

The genus *Osmia* contains over 130 species in North America (Sandhouse 1939, Hurd 1979). Many of the species are only known by one sex, often the male, because of distinctive abdominal sternal and genitalic characters. Here we associate the sexes and describe for the first time the females of *Osmia kenoyeri* Cockerell and *O. virga* Cockerell. Both species have been collected on *Vaccinium angustifolium* Art. and *V. myrtilloides* Michx. in the lowbush blueberry complex in Maine (Boulanger *et al.* 1967, Stubbs *et al.* 1992).

Osmia (Acanthosmioides) *kenoyeri* Cockerell

Female: Length 10 mm; fore wing 6.5 mm; head width 3.5 mm. Color dark greenish-blue; antennae, mandibles, legs dark reddish-brown to black; tegulae black with greenish-blue apical edge. Pubescence of vertex, pronotum, scutum, scutellum white; metasomal tergum 1 white with some black hairs; tarsi with white to reddish brown hairs; rest of body including scopa black. Head wider than long, densely covered with punctures, all punctures of approximately similar diameter; compound eyes slightly convergent below; dorsal 1/3 of gena visible beyond compound eye, gena wider than compound eye; clypeal margin broadly concave, apical margin narrowly impunctate, clypeus in profile slightly convex, densely punctate; hypostomal carina moderately raised, abruptly reduced before angle to half its height; ocelli equally spaced between compound eyes and each other; length of flagellomere 1 only slightly less than 2 and 3 together; mandible with 4 teeth (Fig. 1), apical distance (between teeth) twice width of median constriction, carinae parallel, lower twice as wide as upper, upper tooth oblique, next tooth smallest of the 4 with ventral margin truncate, third tooth triangular, fourth tooth (lowest) longest; maxillary palpal segments 2 and 3 subequal, equalling length of 4 and 5 together; labial palpal segments 1 shorter than 2, 3 equal to 4; ventral margin of galea with dense, short hairs. Thorax densely covered with fine punctures, equalling those on head; propodeal triangle minutely rugose; propodeal pit oval shining; hind tibial spurs straight, only apical 1/5 bent; strigilis with velum shallow concave, amlus long, acutely pointed; fore wing with apical papillae small, cells covered

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with few, short, light hairs, vein A 3 times B. Metasomal terga 1-4 with wide apical impunctate bands, bands 1/4 to 1/3 punctate portion.

Male: The male of *O. kenoyeri* is extremely distinctive and can be distinguished from all other *Osmia* by the structure of mid tarsus 1, the shape of the genitalia and metasomal sternum 2 (Sandhouse 1939).

Type: The holotype of *Osmia kenoyeri*, a male, is from Nebraska Hill, Colorado and was collected on *Trifolium*. It is located at the University of Colorado Museum, Boulder, Colorado. Males from Maine were identical with the holotype.

Distribution: *Osmia kenoyeri* is known from Deblois, Washington County, Maine; Grand Sable Dunes, Alger County, Michigan (M. Arduser, pers. comm.); and Sandhouse (1939) reported it from Colorado, California, Alberta, and the Yukon.

Remarks: In White (1952), the female of *O. kenoyeri* keys out with *O. integra* Cresson (couplet 18) but differs from *O. integra* in the small size of the fore wing papillae and the white pubescence on the dorsum of the thorax. In Mitchell (1962), the female of *O. kenoyeri* also keys to *O. integra* (couplet 12) and the male keys with *Osmia felti* Cockerell (couplet 9) but is easily separated by the globose first segment of the mid tarsus.

Sandhouse (1939) placed *O. kenoyeri* in the subgenus *Acanthosmioides*. White (1952) excluded *O. kenoyeri* from *Acanthosmioides* and placed it in the subgenus *Melanosmia* (equals *Centrosmia*). His decision was based primarily on character similarities with *Osmia bucephala* Cresson. Hurd (1979) placed *O. kenoyeri* in the subgenus *Acanthosmioides*. He provided no explanation for the placement. However, with the correct association of the female, *O. kenoyeri* appears to be more closely associated with *Acanthosmioides*. In the female, the broad apical width of the mandible, general body and pubescence coloration, and apical margins of terga and in the male, the body coloration, mandible, metasomal sterna 2 to 7, genitalia, and leg characters strongly suggest *Acanthosmioides*.

Sandhouse (1939) suggested that *Osmia hendersoni* Cockerell may be the female of *O. kenoyeri*. The type of *O. hendersoni* (U.S. National History Museum #27891) was examined and found not to be the female of *O. kenoyeri*. The shape of the mandible and hypostomal carina, and impunctate bands on abdominal terga 2 and 3 were different. The type of *O. hendersoni* is extremely worn with badly torn wings and missing flagellomeres.

Biology: A nesting site of *O. kenoyeri* was found on the "blueberry barrens" in Deblois, Washington County, Maine (EAO). Females were observed to excavate burrows in the sandy loam soil in late May and adult activity continued to mid June. Burrows varied from 40 to 75 mm in diameter and were not symmetrical in construction. They entered the ground at about a 30° angle and terminated in a series of linear cells within 2 to 3 cm of the soil surface. One nest contained 3 urn-shaped cells, 2 with developing larvae while the third was open and not pro-

visioned. Cells were approximately 80 x 110 mm and composed of a mixture of fine plant fibers, not leaf or leaf pieces, and soil. Cell walls varied from 0.75 to 1.5 mm thick. Cells were easily separated from the surrounding soil and remained intact when excavated. Larvae were mature by early July and in cocoons. The cocoon was composed of two layers. The outer layer was a dense mat of silk fibers that adhered to the soil-fiber cell wall and the inner layer was thinner. A highly polished red brown matrix with individual silk threads was visible and easily separated from the outer layer. The outer anterior surface of the cocoon was formed by a large, flat white nipple which separated the cocoon from the top of the soil-fiber cell. Nineteen males and 9 females were collected the following May from a 30 x 30 cm screened area of the nesting site. No parasites or predators were recovered from the cages.

Examination of the pollen grains remaining in the fecal pellets showed both the tetrad grain structure of Ericaceae (*Vaccinium*) and a smaller, tricolporate grain, perhaps a Fabaceae.

Osmia (*Chenosmia*) *virga* Sandhouse

Female: Length 10 mm; fore wing 7.0 mm; head width 3.0 mm. Color olive-greenish blue; flagellomeres, legs reddish brown, scape black, mandible red brown with black edges. Pubescence white; mandibles, tarsi with golden to red brown hairs, scopa black. Head slightly wider than long, punctures continuous and of similar size; gena with upper 1/3 visible beyond compound eye, twice as wide as compound eye; inner margin of compound eye convergent below; lateral ocelli 2½ diameters distant from compound eye, less than 1 diameter from median ocellus; clypeal apical margin truncate, slightly wavy, narrowly impunctate; hypostomal carina low, uniform, not toothed; mandible with 4 teeth (Figure 1), apical width only slightly greater than mid width, carinae divergent, lower twice as wide as upper; flagellomere 1 longer than 2 or 3; maxillary palpal segment 3 longer than 2, twice 3

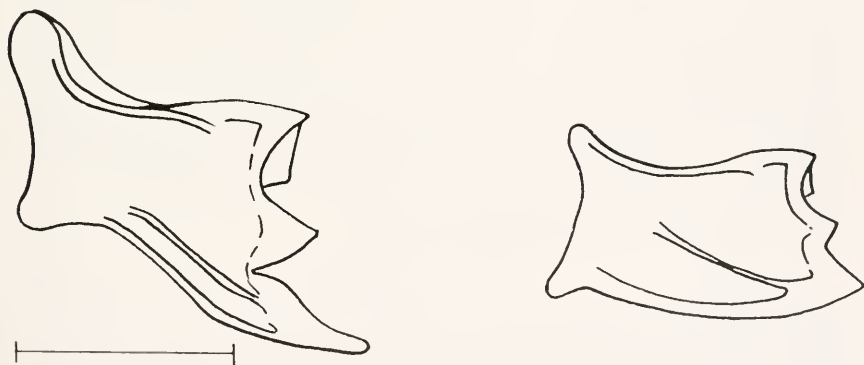


Figure 1. Female mandibles of *Osmia kenoyeri* Cockerell (left) and *Osmia virga* Cockerell (right), scale line is 1.0 mm.

and 4 together, galea ventral surface with numerous short straight hairs, dorsal surface with few scattered, straight hairs; labial palpal segment 2 longer than 1. Thorax densely and evenly punctate, puncture size similar to vertex; propodeal triangle rugose above, granular below; propodeal pit narrow, parallel sided; tegulae almost impunctate; wings minutely and evenly haired, vein A twice B; strigilis with malus margin truncate, velum very short. Abdomen with impunctate bands of metasomal terga 1 to 3½ as wide as punctate portion, 4 to 6 narrower.

Male. The male of *O. virga* is easily identified by the wide impunctate bands on metasomal terga 1 to 4, the truncate margin of metasomal sternum 4, and the structure of the genitalia, especially the broad penis valves (Sandhouse 1939, Mitchell 1962).

Type. The type specimen is from Water Tank, Pennsylvania and is located in the United States Natural History Museum, Washington, D.C. (Holotype #52883). Maine males were identical to the holotype.

Distribution: We have seen specimens from Deblois and Orono, Maine. Sandhouse (1939) reported *O. virga* from Massachusetts, New Jersey, Connecticut, and Virginia and Mitchell (1962) added Wisconsin and Pennsylvania.

Remarks: In Mitchell (1962), the female of *O. virga* keys out as *O. atriventris* Cresson (couplet 17) from which it differs in body color, hypostomal carina, mandibular carinae, impunctate bands of metasomal terga 4 and 5, structure of the strigilis, and scopal color.

Stubbs *et al.* (1992) reported 99% *Vaccinium* pollen from the pollen load of *O. virga* from Maine.

DISCUSSION

The distributional pattern seen in *O. kenoyeri*, Rocky Mountains and northeastern U.S. and Canada, is not uncommon within the genus. *Osmia integra*, *O. bucephala*, *O. subaustralis* Cresson, *O. inermis* (Zetterstedt), and *O. nigriventris* (Zetterstedt) show similar distributions with the northeastern and Rocky Mountain distributions connected through northern Canada and Alaska (Sandhouse 1939, Mitchell 1962, Rust 1974). The latter two species are Holarctic. Biologically, *O. kenoyeri* groups with two other *Acanthosmioides*, *O. nigrobarbata* Cockerell and *O. unca* Michener, in excavating burrows in the ground where the cells are lined with plant materials and soil (Rust *et al.* 1974). Also, the two layered construction of the cocoon and the large, flat white nipple area are characteristics observed in other *Acanthosmioides* species.

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BOOKS RECEIVED AND BRIEFLY NOTED

CATALOGUE OF THE CYPHOPALPATOIRES AND BIBLIOGRAPHY OF THE HARVESTMEN (ARACHNIDA, OPILIONES) OF GREENLAND, CANADA, U.S.A., AND MEXICO. J.C. Cokendolpher & V.F. Lee. 1993. Distributor: The Wishing Well, 1200 Clover Drive, Burkburnett, TX 76354. 82 pp. paperback. \$9.50 incl. shipping.

The goal of this publication is twofold: a catalogue and geographical checklist are provided to the 225 species and 50 genera of Cyphopalpatores and second, a complete literature survey, including newspapers, theses, dissertations, and government reports, is provided for both fossil and recent species. All topics are covered, including folklore.

NYMPHS OF NORTH AMERICAN STONEFLY GENERA (PLECOPTERA). K.W. Stewart and B.P. Stark. 1993. Univ. of North Texas Press. 464 pp. 244 illus. paperback. \$34.50.

This book is a reprint of the 1988 edition published by the Entomological Society of America as Volume XII of the Thomas Say Foundation. It is a baseline reference for serious study of North American Plecoptera and for stream ecological studies.